NATURAL RESOURCES CONSERVATION SERVICE

VIRGINIA CONSERVATION PRACTICE STANDARD

FOREST STAND IMPROVEMENT

(Acre)

Code 666

DEFINITION

The manipulation of species composition, stand structure, and stocking by cutting or killing selected trees and understory vegetation.

PURPOSES

- To improve or sustain timber production for sawtimber, veneer, pulpwood, fiber, poles and pilings
- To improve or sustain non-timber forest products such as nuts, botanicals, medicinals, syrup, honey, greenery and boughs and specialty wood products
- To initiate or improve forest stand regeneration
- To reduce the potential of damage from wildfire, pests, ice, heavy snow and moisture stress
- To restore natural plant communities
- To improve understory conditions for production of forages, forbs and herbs
- To improve aesthetics, wildlife habitat, recreation, and hydrologic conditions
- To increase carbon storage in selected crop trees

CONDITIONS WHERE PRACTICE APPLIES

On forest land where competing vegetation hinders development, growth or stocking of preferred tree and understory species, or where some or the entire stand will be cut or killed for intended purposes.

CRITERIA

GENERAL CRITERIA APPLICABLE TO ALL PURPOSES

Note: This practice is not reportable if the area is not re-established to a desirable stand of trees. Removing trees to change land use is not Forest Stand Improvement.

The harvest-regeneration strategy will be identified for all planned forest improvement harvesting:

- Uneven-aged management systems (single-tree selection, group selection, coppice selection)
- Even-aged management (clear-cut, seed-tree, shelterwood, coppice)

The extent or size of treatment area shall achieve the intended purpose.

Preferred tree and understory species are identified and retained to achieve all planned purposes.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

Spacing, density, size class, number, and amounts of trees and understory species to be retained will follow established guidelines for the intended purposes.

Stocking guidelines shall contain stocking in terms of basal area, spacing or trees per acre by species and size class distribution.

The method, felling direction and timing of tree cutting for harvesting shall facilitate efficient and safe tree removal and protect sensitive areas such as wetlands, riparian zones, cultural resources, and structures. Soil erosion, displacement and compaction, hydrologic impact, and damage to remaining vegetation will not exceed acceptable levels. Refer to "Forestry Best Management Practices for Water Quality" in Virginia Field Office Technical Guide.

Slash and debris left on the site after treatment will not present an unacceptable fire, safety, environmental, or pest hazard. Such remaining material will not interfere with the intended purpose or other management activities.

Comply with applicable federal, state and local laws and regulations during the installation, operation and maintenance of this practice. Refer to "Forestry Best Management Practices for Water Quality" in Virginia Field Office Technical Guide and the Virginia Seed Tree Law.

Specific pesticide recommendations will be obtained from personnel who are licensed by the Virginia Department of Agricultural and Consumer Services in one of the forest pest management categories in accordance with Virginia's Pesticide Laws and Regulations and NRCS Virginia Conservation Standard *Pest Management (Code 595).*

When pesticides or herbicides are used for treatment, they should not be used over or adjacent to ponds, lakes, reservoirs or streams. Also, drift from aerial spraying can injure or contaminate nearby crops and other vegetation.

NOTE: All pesticides must be registered for use in Virginia and approved for use by the U.S. Environmental Protection Agency (EPA). Refer to the current issue of Virginia Pest Management Guide for guidelines, rules and regulations regarding the use of pesticides. Users must always follow instructions and safely precautions on the container label when handling, applying or storing pesticides.

Equipment to Use - Conventional logging skidders and tractors can be used on most sites in the Piedmont and Coastal Plain. Special equipment such as logging mats is needed for extremely wet sites (e.g., wooded swamp) to prevent soil compaction and rutting. Wetland sites shall not be logged when the soil is saturated. In the mountains, cable logging systems should be used where slopes exceed 40-45%. Cable or horse logging systems shall be used where logging road construction could cause landslides or where stabilization of road cuts and fills is difficult or impractical. Logging roads shall not be constructed across slopes where the soil limitation is severe due to landslide hazard.

CONSIDERATIONS

Silvicultural objectives and harvest-regeneration strategies may change over time and may be limited by prior management.

The selection of trees to release should be based on the landuser's objectives, species adaptability to soils involved, and the form and vigor of individual trees.

Preference for treatment should be given in order of site quality, treating the best sites first. Thinning or releasing on poor sites is usually limited to pines, or where the objective is to enhance aesthetics, recreation, non-timber species or wildlife values.

Refer to county soil survey interpretations for each soil series to find the site index and soils limitations for woodlands.

Successful regeneration of desirable species is usually dependent upon timely application of associated practices, e.g., prescribed burning, site preparation, tree and shrub establishment, prescribed grazing and use exclusion. Refer to "Managing the Family Forest in the South" for guidelines.

The extent, timing, size of treatment area, or the intensity of the practice should be adjusted

to minimize cumulative effects (onsite and offsite), e.g., hydrologic and stream alteration, habitat fragmentation, nutrient cycling, biodiversity and visual resources.

Trees over 4" dbh that are cut or killed should be removed or pulled away from remaining trees to lessen chances of insect and fungi infection if wildlife habitat is not a primary purpose and increasing wildlife may impact the intended purpose.

Potential landowner and operator liability should be assessed before forest stand improvement activities begin.

Landowners should secure a written contract with any service provider that specifically describes the extent of activity, duration of activity, responsibilities of each party and amount and timing of payments for services provided.

Consider environmental concerns such as rare, threatened and endangered species, cultural resources, and natural areas.

IMPROVEMENT FOR DIFFERENT WOODLAND USES

Refer to Virginia Technical Note, Forestry #2, *Forest Stand Improvement Methods,* for more details on how to achieve the criteria for forest stand improvement.

For Timber Production and Other Intended Purposes

Remove trees that are crooked, dead, dying, diseased, or injured. Other reasons for tree removal include: excess limbs or poorly formed trees, overcrowded conditions leading to wildfire hazards, and undesirable species for the purposes intended.

If the objective of the landuser is timber production, the following tree species should be favored over all others in a stand: Loblolly, white and shortleaf pines, eastern hemlock, white and red oaks, black walnut, ash, black cherry, basswood, sugar maple, cucumber tree, yellow popular, hickories, red maple, black gum and sweet gum.

However, the species selected for release should be matched to the soil, aspect, precipitation, and other site conditions.

Spacing for Wood Production

A minimum of 400 desirable tree seedlings under 2" dbh or a minimum of 100 trees over 2" dbh per acre should be released from being over-topped or crowded by undesirable species of trees or shrubs so that they will receive full sunlight. Contact the local Virginia Department of Forestry county foresters for more information on spacing.

Method of Thinning or Release

Unwanted hardwood trees, shrubs, vines, or weeds may be removed or controlled by a number of techniques. These include chemical and mechanical treatments, or a combination of two methods. The methods may be classified as:

Mechanical Removal Methods

- Cutting is used to remove undesirable or competing trees, shrubs and vines.
- Girdling is used to kill undesirable trees where use of herbicides is impractical or the landowner does not want to use herbicides. This method works best for easy to kill species and on trees larger than 12 " dhb.

Chemical Removal Methods

- Herbicides (See NRCS Virginia Conservation Practice Standards *Forest Site Preparation (Code 490)* and *Pest Management (Code 595).*
- Girdling followed by a herbicide treatment is a very effective removal method on small acreages.

Individual-stem treatments are usually best where desirable trees are intermingled with weed or cull trees and shrubs and need to be released from competition for sunlight, soil moisture, and plant nutrients.

Time of Thinning or Release

Pines or Conifers

Pines or conifers should be thinned when crowns have closed. Several thinnings will be needed to reach an ultimate stand of 150 – 180 trees per acre.

Hardwoods

Hardwoods should be thinned when average main stand diameter is about 3" – 4" so that the next release will yield commercial products. The ultimate stand should contain about 75 trees per acre on a fairly uniform spacing.

Refer to the publication "Optimum Timing for Ground-applied Forestry Herbicides in the South" for more information.

Slash Disposal

Undesirable trees and tops from a commercial thinning should be used for chipping mills, fuel wood or cut so as to lie close to the ground. This will permit rapid decay and reduce fire danger, disease, and insect activity.

Generally, disposal of the boles, limbs and tops of trees cut in pre-commercial thinnings is not a problem. The severed trees may be left in the stand where felled. However, in pine stands where they fall against the bases of trees selected to leave, severed trees should be pulled away where practical to reduce the possibility of fire losses and, in case of mid-summer droughts, to help avoid insect damage.

Pesticide and Herbicide Use

When pesticides or herbicides are used, follow the directions and heed all precautions on the container label. Also follow all federal, state or local laws.

Spray may drift and harm desirable plants downwind of the treated area. Foliar spraying using aircraft, mist blowers, or ground equipment to apply chemicals is best adapted to large contiguous areas, remote from farms. This method is fast and effective, but there is danger to crops from the drift of the silvicide vapors, unless strict precautions are taken. Foliar spraying may also be used to kill kudzu, poison ivy and other undesired noxious vegetation.

Livestock Protection

If needed, protect area from livestock grazing. Refer to NRCS Virginia Conservation Practice Standards *Fence (Code 382), Use Exclusion (Code 472),* and *Firebreak (Code 394).*

For Wildlife Habitat

Timing of treatment and retaining dead or dying trees, snags, and down material will improve habitat for nesting wildlife. Food and cover can be retained by minimal modifications to composition and spacing regardless of the purpose for treatment. Forested wildlife corridors can minimize fragmentation effects. Refer to the Virginia Conservation Practice Standards *Upland Wildlife Habitat Management Standard (645)* or *Wetland Wildlife Habitat Management (644)* when the intended purpose is wildlife habitat improvement.

The creation of scattered one-half to three-acre openings or strips of 60 to 90 feet wide established to a grass/legume mixture and/or natural herbaceous woody plant mixture will add a diversity of food and cover conditions for most wildlife species. Brush created from these clearings can be piled adjacent to standing trees to create wildlife cover. For more information refer to the publication "Managing Pines for Profit and Wildlife".

Brush piles should be at least 5 feet high and constructed so as to be open underneath from two opposite ends to be effective.

In pinewoods, thinning or selective cutting can improve conditions for wildlife by allowing light to reach the understory and ground to encourage herbaceous and mast producing woods species.

In hardwood sections, selective cutting should be favored by releasing a variety of mast producing species such as white and red oaks, hickories, beech, and other hard and soft mast species.

For wildlife habitat improvement, scattered evergreen species should be retained and/or released from overstory competition for roosting and winter cover in hardwood forests.

Den trees, dead snags and large “wolf” trees (heavy mast producers) should also be preserved. Refer to NRCS Virginia Conservation Practice Standard *Upland Wildlife Habitat Management (Code 645)* for species to favor.

Aesthetics and Recreation Uses

Trees for aesthetic purposes should be healthy and well formed. The species should serve the intended purpose: shade, flowering, fall coloration, etc.

Girdling and herbicides should not be used in recreation areas and other areas where aesthetics and safety are important considerations.

Silvicultural treatments should not interfere with recreational activities near federal, state and local parks, private or public campgrounds and hiking areas. Creating buffers around these areas with picturesque groupings, interesting tree forms and various flowering trees and shrubs will reduce visual impact of forest stand improvement activities.

Non-Timber Forest Products

Non-timber products vary widely and are dependent on the availability and suitability of the site. Forest stand improvement practices will vary widely according to established guidelines. Refer to publications and guidelines published by growers and extension services for cultural activities for improving production of these forest products. Some tree species used for specialty products include balsam fir, sugar maple, black walnut, willows, black locust, pecan, eastern red cedar, red, white and other oaks, hickories, chestnut, cottonwood, hemlocks, green and white ash, elms, and pines.

Carbon Storage

Net carbon benefits are realized when removed trees are used for solid wood products or fuel.

Species composition, density, stocking rate, age, rotation age, and growth rates will affect stand productivity and subsequent carbon storage.

Harvesting methods can impact carbon sequestration in forest soils and remaining trees.

PLANS AND SPECIFICATIONS

Specifications for applying this practice shall be prepared for each site and recorded using approved specification sheets, narrative statements in the conservation plan, or other acceptable documentation

Specifications may be developed for the practice as defined or separately for intermediate harvests and harvest cutting segments of the reportable item.

Specifications shall be based on the soils and their suitability for growing a wood crop or other compatible crops. As appropriate, specify species to favor, spacing, and the length of time (cutting cycle) between intermediate harvests; the number of crop trees and/or the size of the area to be harvested to regenerate the stand, and the method of regenerating the stand.

Refer to Virginia Technical Note, Forestry #1, *Forestry Definitions*, for an explanation of forestry terms used in this standard.

Document the following:

- Location of practice
- Acres treated
- Landowner objectives
- Equipment used
- Desired stocking level
- Type of treatment (cutting, girdling, etc.)
- Preferred tree species
- Purpose of forest (sawlogs, veneer, pulp/paper, wildlife, recreation, maple syrup, nuts or fruit, etc.)

OPERATION AND MAINTENANCE

Periodic inspections during treatment activities are necessary to ensure that objectives are achieved and resource damage is minimized. Follow-up and ongoing management activities will be needed to see that desired results are attained.

REFERENCES

1. Virginia Department of Forestry, 1989 Revised, Third Edition, “Forestry Best Management Practices for Water Quality” in Virginia Field Office Technical Guide.

2. Miller, James H. and Larry M. Bishop, 1989, “Optimum Timing for Ground-Applied Forestry Herbicides in the South”, USDA, Forest Service Management Bulletin R8-MB-28.

3. Willistorn, Hamlin L.; Balmer, William E.; and Daniel H. Sims, 1992, "Managing the Family Forest in the South", USDA, Forest Service Southern Region Management Bulletin R8-MB 1.

4. Puckett, K. Marc; Keyser, Patrick D.; Haney, Harry L.; Godfrey, Cale L.; Warner, Stanley, and Stephen W. Capel. 1998. “Managing Pines For Profit and Wildlife”, Wildlife Information Publication No. 98-1. Virginia Department of Game and Inland Fisheries.

5. National Agroforestry Center, 2000, “Working Trees for Carbon Cycle Balance”, USDA, National Agroforestry Center, East Campus – UNL, Lincoln, NE.

6. Virginia Pest Management Guide, published by the Virginia Cooperative Extension Service (Most current publication, i.e., current year).

7. Virginia Technical Note, Forestry #1, *Forestry Definitions*.

8. Virginia Technical Note, Forestry #2, *Forest Stand Improvement Methods*.

NATURAL RESOURCES CONSERVATION SERVICE

VIRGINIA CONSERVATION PRACTICE STANDARD

FOREST STAND IMPROVEMENT

Approved Practice Narratives

(Acre)

CODE 666

666 D1 Forest Stand Improvement: Forestland will be managed to improve or sustain timber production for sawtimber, veneer, pulpwood, fiber, poles and pilings according to the plans and specifications from the Virginia Department of Forestry.

666 D2 Forest Stand Improvement: Forestland will be managed to improve or sustain non-timber forest products such as nuts, botanicals, medicinals, syrup, honey, greenery and boughs and specialty wood products according to the plans and specifications from the Virginia Department of Forestry.

666 D3 Forest Stand Improvement: Forestland will be managed to initiate or improve forest stand regeneration according to the plans and specifications from the Virginia Department of Forestry.

666 D4 Forest Stand Improvement: Forestland will be managed to reduce the potential of damage from wildfire, pests, ice, heavy snow and moisture stress according to the plans and specifications from the Virginia Department of Forestry.

666 D5 Forest Stand Improvement: Forestland will be managed to restore natural plant communities according to the plans and specifications from the Virginia Department of Forestry.

666 D6 Forest Stand Improvement: Forestland will be managed to improve understory conditions for production of forages, forbs and herbs according to the plans and specifications from the Virginia Department of Forestry.

666 D7 Forest Stand Improvement: Forestland will be managed to improve aesthetics, wildlife habitat, recreation, and hydrologic conditions according to the plans and specifications from the Virginia Department of Forestry.

666 D8 Forest Stand Improvement: Forestland will be managed to increase carbon storage in selected crop trees according to the plans and specifications from the Virginia Department of Forestry.